

The Effects of ACMI Flight Crew's Long Term Outstation Hotel Stay on Accumulated Fatigue

Sigurdur Hrafn Gislason
SmartLynx Airlines, Iceland

Abstract – ACMI flight crews spend considerable time away from home on outstations. This manuscript suggests that long term stay carries its own considerations in regards to rest recovery with practical implications for Fatigue Risk Management. Four recovery factors are identified and are to be correlated with 28 crew behaviors. The end result might indicate improvement considerations for airline management organizing a long term contract with ACMI crews.

Keywords – ACMI flights, aircraft, fatigue, job demands-resources model, management, risk.

I. INTRODUCTION

All airlines must work by the agreed rule sets of the International Civil Aviation Organization (ICAO) published in 19 annexes. This is the framework by which all airlines operate further enhanced by regional regulations (e.g. EASA) and local authority rules (e.g. Latvian Civil Aviation Agency).

There is, though, an underlying assumption to the ICAO rule sets: they implicitly assume that the airline operators operate on a fairly steady schedule from a fairly limited number of destinations. Most airlines have central hubs, i.e. airports from which they operate a number of flights to destination airports before returning back to the hub. There are variations of this setup but this is the way the industry has mainly operated since its inception in the 1920s. Like bus and train routes, the flights were organized according to specific market requirements and available destinations.

Those airlines that did not operate according to this fairly rigid system sometimes found themselves at odds with regulations that did not account for a different business model. ACMI operators are airlines that provide other airlines with Aircraft, Crew, Maintenance and Insurance (ACMI). These are business to business (B2B) operators providing other airlines with aircraft capacity in times of shortage, e.g. if an airline has an offer to carry tourists from point A to point B but does not have any available aircraft. The airline then contacts the ACMI operator who operates the route under the name of the original airline. The aircraft may even be fully liveried in the customer colors and the average passenger would never notice any difference.

These airlines, however, do not have the luxury of preplanning and establishing a hub. The contracts are usually short term and only last a few months, maybe a few years on the outside. The crews are hired to be based on the operating base and have to spend the duration of the contract in airport hotels. A life not as exciting as it might sound. Turnover of crews is kept to a minimum to save costs so each crew member may have to make himself a make-shift home.

II. FATIGUE RISK MANAGEMENT

ICAO's Fatigue Risk Management rules, located in ICAO Annex 6, focus mainly on the responsibility of the airline to analyze their schedule so that hazardous working hours may be identified and mitigated.

However, in accordance with chapter ICAO Annex 6, paragraph 4.10 [1], airlines are to implement a Fatigue Risk Management System (FRMS) as prescribed by each state requirements, which should be in accordance to ICAO document 9966, Fatigue Risk Management for Regulators [2]. The FRMS should be based on providing multiple redundant defenses against fatigue related

risks. One major component of an FRMS is the focus on the production of flight crew duty schedules. They should not overly tax the crew member and increase the level of fatigue unduly.

A second major component of an FRMS is the training and education for crews, focused on their own responsibility to maximize the amount of sleep obtained immediately prior to flights, identifying circumstances where the likelihood of fatigue is elevated and managing the risks associated with fatigue related impairment.

If a flight duty schedule is analyzed to be too taxing, it is therefore incumbent on the airline to find ways to ensure that high levels of fatigue do not take place and distribute the duties amongst more crews, thus lightening the load. As FRMS pertains to the individual crew member, there is still the implicit assumption that the crew member gets to rest at his home base, at his home residence where he can fall back into his familiar rest routine. This does not apply to the ACMI crews which have to return to their airport hotel, socialize with their colleagues and be constantly surrounded with work reminders.

While the airline is responsible to minimize the risk of fatigue in their scheduling, it is also the responsibility of the crew member to ensure that he maximizes his rest potential during his off hours. Every crew member is obligated to evaluate his fitness to fly and report himself unfit to fly if he is tired, sick or otherwise incapacitated. There is a risk though – while it is easy to identify sudden fatigue, maybe due to emergency work hours, sudden insomnia or sickness; it may be more difficult for the crewmember to accurately assess his/her own fatigue if it has been slowly deteriorating over time.

III. ACCUMULATED FATIGUE

Most fatigue research has been conducted on the immediate fatigue, i.e. fatigue that takes place after a very taxing or prolonged duty, but there has been a shift of attention to the idea of accumulated fatigue, or fatigue that gradually builds across duty periods. The intent of FRMS is to identify when there is a risk of accumulated fatigue but crews on outstations face a vastly different rest environment than is addressed in the ICAO rulebook.

Currently ICAO addresses accumulated fatigue by setting limits on the number of duty hours in a certain period of time [1]. It bears noting that ICAO does not make there a distinction between duty on crews on home bases and crews actually stationed long-term away from home.

ICAO also encourages fatigue reporting when a crewmember self-diagnoses himself as being too fatigued to operate. There are clear rules that no punitive actions should be taken by the airline to the crewmember but in reality there is a great hesitancy for crews to disrupt airline operations, which can be very costly, especially when other standby crews may not be available. Good intentions aside, there is the possibility that crews fear repercussions if they are not being supported by strict regulatory requirements. It may be difficult to report accumulated fatigue when there are no direct and well defined scheduling causes visible in the system.

IV. JOB DEMANDS – RESOURCES MODEL AND CREW RECOVERY

The Job Demands – Resources (JD-R) Model describes the interaction between job demands and job resources and how it influences the well-being of the employee [3]:

1. Job demands are described as those physical, psychological, social or organizational aspects of any job that require effort or any other psychological or physiological cost.
2. Job resources are the more positive aspects of the job that refer to the physical, psychological, social or organizational aspects of the job that are functional in achieving work goals, reduce job demands with their associated costs, and stimulate personal growth, learning and development.

These two factors interact via two different underlying psychological processes that have their effect on performance and well-being of the employee. Strain is the process where the demands

prove to be too much for the available resources and the cost of the task becomes so great that the employee starts performing in a degraded manner. This is referred to as compensatory costs, strategy adjustments and fatigue after-effects. The second process is motivational in nature, stating that certain job aspects may foster employee growth and competence, i.e. autonomy at work, good managerial feedback, and social support and learning opportunities. [3]

Recovery refers to the process during which an individual's functioning returns to its normal non-work level and in which strain is reduced. It has also been defined as a process that allows individuals to replenish their resources. Recovery is, though, not simply a respite from work. It is a rebuilding of resources via various factors [4]. If recovery is insufficient, this may lead to extra strain during work and lead to health issues [5]. Recovery thus acts as a buffer, either by reducing strain or by replenishing resources.

The question has been raised [6], what if airline crew members are perhaps unable to fully utilize their rest periods while staying in airport hotels, particularly if the stay is somewhat extensive. This would possibly lead to insufficient recovery and thus to fatigue in the long run. The research [4] on recovery is quite relevant to this question. Research is built on the Effort-Recovery Model [5] and the Conservation of Resources Theory [7]. Recovery would thus consist of a two complementary processes:

1. To refrain from work demands and to avoid activities that call upon the same functional systems or internal resources as those required at work.
2. Gaining new internal resources such as energy, self-efficacy or positive mood can help restore threatened resources.

Four mechanisms have been identified that influence recovery [4]:

1. Work Detachment
2. Mastery
3. Relaxation
4. Control.

These mechanisms can be seen as personal strategies to restore or maintain resources and health.

Work Detachment is the ability to distance yourself from the work environment, visual cues, reminders and associated thoughts. This includes phone calls, emails and any other job related activities. This goes beyond being simply removed from the work place – it means being able to switch off mentally and not call on any resources for job related tasks. This factor is measured by the following questions:

1. I forget about work.
2. I do not think about work at all.
3. I distance myself from work.
4. I get a break from the demands of work.

Mastery is the ability to engross yourself in the task of self-betterment, of mastering a task, skill or ability. While taxing on his/her own this enables feelings of competence and increased resources. This factor is measured by the following questions.

1. I learn new things.
2. I seek out intellectual challenges.
3. I do things that challenge me.
4. I do something to broaden my horizons.

Relaxation is the ability to avoid any physical exertion. This is important as it signifies the ability to take a break from work demands. The inability to take relaxation has been linked to negative affect and health. By raising the positive affect, job stress effects may be reduced [8]. This factor is measured by the following questions:

1. I kick back and relax.
2. I do relaxing things.
3. I use the time to relax.
4. I take time for leisure.

TABLE I
IDENTIFIED CREW BEHAVIOR ON OUTSTATION

No.	Behavior	Connection to Recovery Factor
1	Crew member schedules breakfast with other crewmembers	WD
2	Crew member finds a “secret” place away from hotel, only to enjoy for him/herself	WD
3	Crew member sets up a training regime in the hotel gym	M
4	Crew member attends a crew party near every night when off duty	WD
5	Crew member stays in room and avoids contact with colleagues during off duty days	WD
6	Crew member actively explores the region in which he/she is based	C
7	Crew member uses off time to further education or training	M
8	Crew member joins other like-minded colleagues for activities away from hotel	WD
9	Crew member rents a car to travel more extensively while on off days	WD
10	Crew member attends dinners with colleagues most all nights	WD
11	Crew member attends the swimming pool (if available) near every day	R
12	Crew member goes to the nearby beach (if available) on a regular basis	R
13	Crew member goes out on the nightlife when on off duty nights	WD
14	Crew member goes sightseeing alone	WD
15	Crew member catches up on reading during off hours	M
16	Crew member starts drinking more than usual during off hours	C
17	Crew member regularly contacts family at home via telephone or video chat	WD
18	Crew member uses medication to regulate sleeping patterns	C
19	Crew member swaps duties with other crew members in order to organize his off day activities	C
20	Crew member does some shopping during off duty hours (retail therapy)	C
21	Crew member tries actively to meet new people away from work	WD
22	Crew member plays computer games in his/her hotel room during off duty hours	R
23	Crew member watches TV-shows or movies in his/her hotel room during off duty hours	R
24	Crew member is unable to schedule off time duty due to schedule instability	C
25	Crew member experiences homesickness	WD
26	Crew member arranges for his family to join him/her on base for some extended period of time	WD
27	Crew member immerses him/herself in a hobby during off hours	M
28	Crew member personalizes their hotel room (e.g. photographs on stands, moving/removing furniture)	C

Control is the extent of which the employee has influence on his leisure time, what activity to pursue, the timing of it and how best to perform it. Personal control has been shown to have a positive effect on individual well-being [9]. This factor is measured by the following questions:

1. I feel like I can decide for myself what to do.
2. I decide my own schedule.
3. I determine for myself how I will spend my time.
4. I take care of things the way I want them done.

In the case of outstation crews, there is little possibility for them to exert any control on their leisure time as the schedules are prescribed by headquarters and the way they are performed are

strictly regulated. To add to the complication, they are often required to be on standby for extended periods thus lessening their ability to control their own leisure time.

Crews can however try to seek detachment by minimizing socialization with work colleagues and avoid work related environment. In reality, the close proximity of all work members at the hotel accommodation means that every breakfast, every dinner, every gym visit will mean a potential work encounter with colleagues. In addition, crew members are informed daily about their schedule changes, timing changes and are required to check their emails and SMS messages on a regular basis. They can seek mastery through gym attendance, reading or otherwise any avenue of self-improvement. Relaxation is very much possible in most hotels and those crews wishing to maximize that factor should not have any trouble finding the facilities and time to do so.

Moderate relationships between these recovery experiences and well-being measurements have been found [4]:

1. Work Psychological Detachment and Control have negative relationship with health complaints, emotional exhaustion, depressive symptoms, need for recovery and sleep problems.
2. Relaxation has negative relationship with health problems, emotional exhaustion, need for recovery and sleep problems.
3. Mastery is negatively related to depressive symptoms, emotional exhaustion and need for recovery.
4. All four factors have positive relationship with life satisfaction.

During directly testing the effects of these mechanisms on the JD-R model following was found:

1. Work Detachment has a negative relationship with work fatigue.
2. Mastery has a positive relationship with work engagement.
3. Relaxation and Control were not found to have any significant relationships with neither fatigue nor work engagement.[10]

In further researches [11], [12], [13], [14] on cabin crew rest, no significant detrimental effect of hotel stays was found, but the study only measured a few days' length of stay and did not investigate the effects of longer term stays. Staying in a hotel for a few days can be different from having to make it a temporary home.

To further questions [6] in regards to flight crews' possible inability to fully recover while on outstations, this relationship can be elaborated on by investigating further the actual behavior of flight crews on base, the connection between those behaviors to the 4 factors [4] and then seek confirmation on whether or not these factors significantly affect levels of fatigue.

The questionnaire consists of Recovery Experience Questionnaire [4] which measures (see Table I):

- (WD) Work Detachment
- (M) Mastery
- (C) Control
- (R) Relaxation.

Research is carried out for focus group member that has at least 6 years of work experience and has worked on outstation projects on at least 5 occasions, all participation is anonymous. The hubs for distributing the questionnaire are: Pristina, Budapest, Brussels, Prague, London, Cardiff, Birmingham, Antalya, Madrid.

Regression analysis on the four factors – Work Detachment, Control, Relaxation and Mastery – determines the predictive validity of the focus group identified behaviors to these factors, thus giving a better resolution to how the behavior on base can predict the factor scores. The scores of the four factors are valuable in themselves but the added detail of the identified behaviors improves the overall picture of crew behavior and its effect on crew recovery.

There are three fatigue self-reporting questions in the questionnaire which serves as a rough indicator on a relationship between the factors and fatigue, and/or between certain behavior patterns on fatigue.

V. CONCLUSION

The research results do not only focus on the duty distribution aspect of Fatigue Risk Management System but are also trying to organize the setup of the outstations so that they encourage the facilitating recovery behaviors and discourage the hindering behaviors. This is particularly relevant for Work Detachment and its direct connection to fatigue at work [10].

The results also aid station managers, who always are on location, to identify when the behavior of the crews may become negative to the efficacy of their rest.

This can be added to the FRMS system of the airline that can implement actions to improve situation on base. The practical implications of this survey assist airlines to facilitate certain behaviors that may increase the positive aspects of the recovery factors. This could minimize fatigue and prevent accumulated fatigue. Preventing fatigue increases safety – the common goal of the whole aviation industry.

REFERENCES

- [1] ICAO PANS-ATM Doc.4444, ATM/501, 15th Edition, *Procedures for Air Navigation Services – Air Traffic Management, Annex 6 – Operation of Aircraft*. Canada, Montreal, Quebec: ICAO, 2010.
- [2] ICAO PANS ATM Doc.9666, *Fatigue Risk Management for Regulators*, Canada, Montreal, Quebec: ICAO, 2012.
- [3] A. B. Bakker and E. Demerouti, “The Job Demands-Resources Model: State of the art,” *Journal of Managerial Psychology*, vol.22(3), pp. 309–328, 2007. <http://dx.doi.org/10.1108/02683940710733115>
- [4] S. Sonnentag, and C. Fritz, “The Recovery Experience Questionnaire: Development and validation of a measure for assessing recuperation and unwinding from work,” *Journal of Occupational Health Psychology*, vol. 12(3), pp. 204–221, 2007. <http://dx.doi.org/10.1037/1076-8998.12.3.204>
- [5] T.F. Meijman and G. Mulder, “Psychological aspects of workload,” in P. J. D. Drenth and H. Thierry (Eds.), *Handbook of work and organizational psychology*, vol. 2, pp. 5–33, 1998, Hove, England: Psychology Press.
- [6] B. J. Searle, “Detachment from Work in Airport Hotels Issues for Pilot Recovery,” *Aviation Psychology and Applied Human Factors*, vol. 2(1), pp. 20–24, 2012. <http://dx.doi.org/10.1027/2192-0923/a000019>
- [7] S.E. Hobfoll, *Stress, culture, and community: The psychology and physiology of stress*. New York: Plenum Press, 1998. <http://dx.doi.org/10.1007/978-1-4899-0115-6>
- [8] J. J. L van der Klink, R. W. B. Blonk, A. H. Schene, and F. J. H. van Dijk, (2001), “The benefits of interventions for work-related stress,” *American Journal of Public Health*, vol. 91(2), pp. 270–276, 2001. <http://dx.doi.org/10.2105/AJPH.91.2.270>
- [9] A. Bandura, *Self-efficacy: The exercise of control*. New York: Freeman, 1997.
- [10] U. Kinnunen, T. Feldt, M. Siltaloppi, and S. Sonnentag, “Job demands-resources model in the context of recovery: Testing recovery experiences as mediators,” *European Journal of Work and Organizational Psychology*, vol. 20(6), pp. 805–832, 2011. <http://dx.doi.org/10.1080/1359432X.2010.524411>
- [11] S. Sonnentag and E. Natter, “Flight attendants’ daily recovery from work: Is there no place like home?” *International Journal of Stress Management*, vol. 11(4), pp. 366–391, 2004. <http://dx.doi.org/10.1037/1072-5245.11.4.366>
- [12] C. Fritz and S. Sonnentag, “Recovery, well-being, and performance-related outcomes: The role of workload and vacation experiences,” *Journal of Applied Psychology*, vol. 91(4), 936–945, 2006. <http://dx.doi.org/10.1037/0021-9010.91.4.936>
- [13] S. Sonnentag, C. Binnewies and E. J. Mojza, “Staying well and engaged when demands are high: The role of psychological detachment,” *Journal of Applied Psychology*, vol. 95(5), pp.965–976, 2010. <http://dx.doi.org/10.1037/a0020032>
- [14] S. Sonnentag, I. Kuttler, and C. Fritz, “Job stressors, emotional exhaustion, and need for recovery: A multi-source study on the benefits of psychological detachment,” *Journal of Vocational Behavior*, vol.76, pp.355–365, 2010. <http://dx.doi.org/10.1016/j.jvb.2009.06.005>



Sigurdur Hrafn Gislason has been a Master’s student of Psychology at the University of Latvia. In 1999 he was a Cand. Psych studies, University of Aarhus, Denmark.

Work Experience: 2000-2004 – Operations Supervisor at Air Atlanta. 2004 – Chief Air Operations, Kabul Airport, NATO. 2006 – Head of District, Trincomalee, Sri Lanka, SLMM. 2007 – Political Advisor on Civil Aviation Development in Afghanistan, NATO. Since 2007 – Safety & Security Manager at SmartLynx Airlines.

His fields of research: accident prevention, airworthiness, safety.

E-mail: Sigurdur.Gislason@smart-lynx.com